Table 1. PCBs Chemical Decomposition Technology

Category	Method	Description	PCB Conc.	Chemical used	Op. Cond. Temp/Pres	Company	Basic Technology	Cost		Characteristics	Approval		Starting Date
								Install	Chem		Tec	Plant	
Dechlorination reaction by Caustics	DMI/NaOH	PCBs are decomposed by NaOH under DMI solvent. Products are Biphenyl and NaCl. Hydrogen source is insulation oil.	High/ Low	NaOH DMI(1,3-dimethyl-2-imidazolidinon)	200-210 C /Atm	Tokyo Denryoku /Mitsui Co./Neos	Own Process	High	High	-Complicated Process -DMI recovery is key to this process.	Yes L1	U/C	2001 Tokyo Denryoku
	t-BuOK	2 step reaction ; 1st reaction is catalytically dechlorination by hydrogen under paraffin and 2nd stage is reaction of PCBs with t-BuOK to produce Kcl and Biphenyl-buthoxide etc.,	High	Solvent (Paraffin) H2, N2, Pd/C cat	180-210 C / Atm	Kansai Tech /Kansai Denryoku	Own Process	High	High	-1st stage can be applied under 15% PCB concentration. -PCB concentration in 2nd stage should be 200 ppm under. -Cost of t-BtOK is very expensive.	Yes L1	Req.	TBD
			Low	t-BuOK	200-250 C / Atm								
	BCD	Dechlorination reaction is taken place under the N2 condition at 300-350 deg C and atm, by adding hydrogen donor, catalyst and caustic to PCBs. Products are Biphenyl; it's derivative, inorganic salt and small amount of water.	High/ Low	NaOH or KOH, Hydro-carbon, catalyst	300-350 C / Atm	Ebara	Licensed from USA	High	Low	-High reaction temperature may cause of fire. -Very difficult to control operation temperature.	Yes L1	Yes	2000 Ebara
	SD	Dechlorination occurs by Dispersed Sodium at low temperature and atmospheric condition. Good reactivity. Products are Biphenyl etc.	High	Na dispersed	160-170 C / Atm	Nihon Soda/ Ito Chu	Own Process	Low	Med.	-Low Reaction Temp. -Simple Process. -Oil product is easily separated. -Na is produced by himself.	Yes L1	Yes	2000 Nihon Soda /Tohoku & Hokuriku Denryoku
			Low	Na dispersed/ Activated agents	50-60 C / Atm								

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								Install	Chem		Tech	Plant	
Dechlorination Reaction by Caustics	OSD	Dechlorination occurs by Dispersed Sodium at low temperature and atmospheric condition. Good reactivity. Products are Biphenyl etc.	High/ Low	Na dispersed	80-140 C / Atm	Nuclear Fuel Ind. Ltd. /Sumitomo Corp/Sumitomo Denko	Licensed from Canada (Ontario Hydro Technology)	Low	High	-Low reaction temp. -Simple process. -High cost Na, imported from Canada.	Yes L1	Yes	1999 Sumitomo Denko
	SP	Dechlorination occurs by Dispersed Sodium at low temperature and atmospheric condition. Good reactivity.	High Low	Na dispersed	120-190 C /Atm 90 C/Atm	Shinko Pantec	Licensed from Canada (Powertech)	Low	High	-Low reaction temp. -Simple process. -High cost Na, imported from Canada	Yes L3	No	TBD
	UV/Catalyst	PCB and NaOH are solved in Hydrogen donor solution, and UV irradiation. Dechlorination is taken place and Cl will be react with NaOH. In 2nd stage reaction, PCB remained is dechlorinated by Catalyst to Biphenyl.	1st Reaction 2nd Reaction	UV/NaOH /IPA Pd/C cat	50-60 C / Atm 75 C / Atm	Toshiba	Own Process	High	Mid.	-Low reaction temp. -Rapid reaction. -Complicated process. -Safety for Mercury lamp -High catalyst cost.	Yes L 3	Req.	TBD Test plant: 2000

Approval:

- Tech --- Approved Level (L) of technology by authority.
  L1: Plant is in operation or construction. L2: Pilot plant test has been completed.
  L3: Bench scale tests have been completed. L4: Laboratory tests have been completed
- Plant --- Status of Construction:
  U/C ; Under Construction Req. ; Requesting
- TBD – To Be Determined

Category	Method	Description	PCB Conc.	Chemical used	Op. Cond. Temp/Pres	Company	Basic Technology	Cost		Characteristics	Approval		Starting Date
								Install	Chem		Tech	Plant	
Total Decomposition of PCB	Super Critical water(SCW) oxidation	Oxidation reaction by using High Temp/High pressure water(SCW).	Low/ High	Water/ NaOH	380 C / 300 Atm	Organo	Own Process	High	Low	-High pressure and high temperature -Corrosion problem by severe condition.	Yes L2	No	TBD
	Hot Water Dechlorination	Oxidation reaction by using high temp and high pressure hot water.	Low/ High	Water/ Sodium carbonate	380 C / 270 Atm	MHI (Mitsubishi Heavy Industry)	Licensed from USA	High	Low	-High pressure and high temperature -Corrosion problem by severe condition.	Yes L1	U/C	2000 MHI, Nagasaki
	Gas phase hydrogen reduction	Reduction by high temperature hydrogen.	Low/ High	Hydrogen	Over 850 C / Atm	Tokyo Boeki/ Nihon Sharyou	Licensed from Canada (Ecological)	High	Low	-High Temperature. -Require H2 generator	Yes L2	No	TBD
	UV/Biodegradation	1st Stage, PCB is decomposed by UV. 2nd Stage,PCB is decomposed by Biodegradation	High	Solvent (IPA) /NaOH/UV	Amb/Atm	JR	Own Process	High	Low	-Long reaction time for both stages. -Safety for Mercury lamp -Bacteria -Treatment of bacteria sludge.	Yes L3	No	TBD
			Low	Bacteria	30 C/ Atm								
	Mechano-chemical	Dry grinding PCB with CaO and SiO2 in a ball mil.	Low/ High	CaO, SiO2	Amb/Atm	Tohoku Univ. Saito	Own process	Low	Low	-Low temp/low press. -Easy operation -Low Installation and operation cost.	No (U/A) L4	No	TBD

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- Plant – Status of Construction:
  - U/C ; Under Construction
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- TBD – To Be Determined